Docket No. 50439
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

APPLICANT:	Barstad et al.	
SERIAL NO.:	09/605,442	GROUP: 1742
FILED:	June 28, 2000	EXAMINER: H. Wilkins III
FOR:	ELECTROLYTIC COPPER ELECTROPLATING COMPOSITIONS	

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APPEAL BRIEF

Applicant respectfully appeals the decision of the Examiner, dated August 15, 2006, finally rejecting claims 124-132, 134-137, 141-154 and 158-167.

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I. REAL PARTY IN INTEREST

The real party in interest is Shipley Company LLC of Marlborough, Massachusetts.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences known to Appellant or Appellant's representatives that will directly affect or be directly affected by or have a bearing on the Board's decision in the pending Appeal.

III. STATUS OF THE CLAIMS

Claims 1-167 have been presented in this application.

Claims 1-123, 133, 138-140, and 155-157 have been cancelled.

Claims 124-132, 134-137, 141-154 and 158-167 have been finally rejected and presently are on appeal (see the attached Appendix A).

IV. STATUS OF THE AMENDMENTS (AFTER FINAL REJECTION)

No amendments after final rejection have been presented.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Appellant's claimed invention is directed to methods for electrolytrically depositing copper onto semiconductor microchip wafer substrate having microvias or trenches from an electroplating composition that comprises at least one soluble copper salt, an electrolyte, a suppressor agent, and one or more brightener compounds having a molecular weight of about 1000 or less and that are present in a concentration of at least about 1.5 mg per liter of the electroplating composition, and wherein one or more brightener compounds comprise bis-sulfonopropyl disulfide. See independent clam 124 at Claims Appendix A.

Appellant's methods are particularly useful for filling microvias and trenches of microlectronic wafer substrates as required by current and anticipated semiconductor fabrication requirements. See application at page 4, lines 10-16. The methods of the invention include use of a copper plating composition that includes high brightener component concentrations, such as at least 1.5 mg per liter of plating solution. See page 4, lines 18-19 of the application.

Methods of the invention can reliably plate copper deposits that are essentially or completely free of voids, inclusions or other plating imperfections. See application at page 4, lines 10-16.

Appellant's independent claims 124, 137, 154 and 160

Appellant has four independent claims on appeal: claims 124, 137, 154 and 160. Those claims read as follows:

> *Claim 124.* A method for plating a semiconductor microchip wafer substrate, comprising:
>
> electrolytically depositing copper onto a semiconductor microchip wafer substrate having microvias or trenches from an electroplating composition that comprises at least one soluble copper salt, an electrolyte, a suppressor agent, and one or more brightener compounds having a molecular weight of about 1000 or less and that are present in a concentration of at least about 1.5 mg per liter of the electroplating composition,
>
> wherein one or more brightener compounds comprise bis-sulfonopropyl disulfide.

Claim 137. A method for plating a semiconductor microchip wafer substrate, comprising:

electrolytically depositing copper onto a semiconductor microchip wafer substrate having microvias or trenches from an electroplating composition that comprises at least one soluble copper salt, an electrolyte, and one or more brightener compounds present in a concentration of at least about 1.5 mg per liter of the electroplating composition,

wherein the one or more brightener compounds comprise a group of the formula R'-S-R-SO_3X where R is optionally substituted alkyl, optionally substituted heteroalkyl, optionally substituted aryl or optionally substituted heteroalicyclic; and X is a counter ion,

wherein one or more brightener compounds comprise bis-sulfonopropyl disulfide.

Claim 154. A method for plating a semiconductor microchip wafer substrate, comprising:

electrolytically depositing copper onto a semiconductor microchip wafer substrate having microvias or trenches from an electroplating composition that comprises at least one soluble copper salt, electrolyte, suppressor agent, and one or more brightener compounds present in a concentration of at least about 1.5 mg per liter of the electroplating composition,

wherein the one or more brightener compounds comprise a group of the formula R'-S-R-SO_3X where R is optionally substituted alkyl, optionally substituted heteroalkyl, optionally substituted aryl or optionally substituted heteroalicyclic; and X is a counter ion,

wherein one or more brightener compounds comprise bis-sulfonopropyl disulfide.

Claim 160. A method for plating a semiconductor microchip wafer substrate, comprising:

electrolytically depositing copper onto a semiconductor microchip wafer substrate having microvias or trenches from an electroplating composition that comprises at least one soluble copper salt, an electrolyte, and one or more brightener compounds that comprise bis-sulfonopropyl disulfide and the one or more brightener compounds present in a concentration of at least about 1.5 mg per liter of the electroplating composition.

All the pending claims call for bis-sulfonopropyl disulfide

A preferred brightener agent of Appellant's is bis-sulfonopropyl disulfide. See page 10, lines 11-12 of the application. **All the pending claims call for bis-sulfonopropyl disulfide.**

Demonstrated effective plating of microlectronic wafer substrates

Such effects are specifically demonstrated in the comparative examples of the application as filed. In this regard, attention is also directed to the comparative results detailed at Examples 2 and 3 of the application. In Example 2, using a copper electroplating composition of the invention, semiconductor microvias having 200 nm diameters and 7:1 aspect ratios were filled with copper deposits having no defects as determined by focused beam examination. In comparative Example 3, a copper electroplating composition having a brightener concentration of 0.35 mg/l produced a copper deposit with defects in microvias having diameter of 200 nm and 4:1 aspect ratio. See pages 16-17 of the application.

Additional use of suppressor agent

Appellant's preferred methods include use of a suppressor agent such as a polyether. Appellant has found that use of a suppressor agent in combination with elevated brightener concentrations can result in effective "bottom-fill" copper plating of a microvia or other aperture without defects such as inclusions or voids. See page 5, lines 12-15 of the application. Independent claims 124 and 154 each call for a suppressor agent.

In preferred methods, the brightener concentration is maintained at such high concentrations throughout the entire or at least substantial portion of a plating cycle. Such maintenance of brightener concentrations entails regular addition of brightener during a plating cycle as the brightener component plates out. See page 5, lines 4-10 of the application.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Two issues are on appeal:

1. Whether claims 124-132, 134-137, 141-154 and 158-167 are unpatentable under 35 U.S.C. §103 over Beach et al. (U.S. Patent 4,334,966) in view of Bernards et al. (U.S. Patent 5,051,154) and further in view of Dubin et al. (U.S. Patent 5,972,192).

2. Whether claims 124-132, 134-137, 141-154 and 158-167 are unpatentable under 35 U.S.C. §103 over Dahms et al. (U.S. Patent 3,778,357) in view of Dubin et al. (U.S. Patent 5,972,192) and further in view of Bernards et al. (U.S. Patent 5,051,154).

VII. ARGUMENT

1. Rejection of claims 124-132, 134-137, 141-154 and 158-167 under 35 U.S.C. §103 over Beach et al. (U.S. Patent 4,334,966) in view of Bernards et al. (U.S. Patent 5,051,154) and further in view of Dubin et al. (U.S. Patent 5,972,192).

(a) The Examiner's rejection:

It is acknowledged that none of three cited documents alone renders obvious Appellant's claimed invention.

The position is nevertheless taken that it would have been obvious to carefully select and combine isolated features of Beach et al. (U.S. Patent 4,334,966), Bernards et al. (U.S. Patent 5,051,154) and Dubin et al. (U.S. Patent 5,972,192) and that careful combination would have rendered Appellant's claimed invention obvious.

As specifically admitted at page 2 of the Final Office Action dated August 15, 2006:

> "Beach et al fails to teach (1) that the brightener included bis-sulfonopropyl disulfide and (2) plating on a semiconductor substrate."

However, the position is taken as follows as stated at page 3 of the Final Office Action dated August 15, 2006:

> Bernards et al teach (see col 6, lines 29-37) using a bis-sulfonopropyl disulfide as a brightener at an amount up to 3.0 ppm by weight of solution (which converts to 3.0 mg/L).

Therefore, it would have been obvious to one of ordinary skill in the art to have used the bis-sulfonopropyl disulfide compound of Bernards et al. as the brightener of Dahms et al because the bis-sulfonopropyl disulfide is a conventional brightener in copper electroplating that improves throwing power (see col. 5, line 49 to col 6, line 13 esp col. 6, lines 5-10) of the electroplating, thus making plating in vias and trenches more even.

Dubin et al. teach (see col. 1lines 5-40) electroplating copper onto a dielectric silicon layer of a microchip wafer with microvias and trenches.

Therefore, it would have been obvious to one of ordinary skill in the art to have applied the copper electroplating method of Beach et al to the silicon microchip wafer with microvias and trenches of Dubin et al because the method of Beach et al has good electroplating properties.

(b) Appellant's position:

A. No incentive would have existed to combine the cited documents as proposed by the final rejection.

The skilled would not have had any incentive to carefully combine selected aspects of the cited documents as proposed by the instant rejection.

Thus, the primary citation of Beach et al. is directed to plating *gravure rolls* (a type of printed plate). Thus, the primary citation is outside the electronics industry. Clearly, the skilled worker would not look to gravure rolls for materials to plate much different semiconductor wafers.

Bernards is also quite distinct and pertains to plating on *printed circuit bo*ards.

Persons skilled in the art recognize that plating on copper on a microchip wafer is considerably more difficult, and possess unique issues, relative to plating copper on a printed circuit board as reported by Bernards et al. or gravure plates as reported in Beach et al.[1]

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[1] It is well-documented that persons skilled in the art recognize that plating copper on a microelectronic wafer is considerably more difficult, and poses unique issues relative to plating copper on a printed circuit board. This is made clear in, for instance, U.S. Patent 6,290,833. Thus, at column 2, lines 35-39 of that patent, the following is reported (bold emphasis added):

> Despite the advantageous properties of **copper, it has not been as widely used as an interconnect material as one would expect. This is due, at least in part, to the difficulty of depositing copper metallization** and, further, due to the need for the presence of barrier layer materials.

Similarly, U.S. Patent 6,297,154 reports the following at column 2, lines 33-41 (bold emphasis added):

> As noted in U.S. Pat. No. 5,627,102 to Shinriki et al., **one problem associated with the formation of metal interconnects in that voids form in the metal filling of the recess**. Such faulty fill-up leads to a failure to establish a sound electrical contact. **The problem with faulty fill-up increases with increasing aspect ratio**. Consequently, as the width of the recess decreases, the problems of faulty fill-up increase.

U.S. Patent 6,171,960 reports the following at column 1, lines 10-27 (bold emphasis added):

> The fabrication of deep submicron ultra large scale integrated (ULSI) circuits requires long interconnects having small contacts and small cross-sections. To achieve the above objectives, the preferred interconnect material is copper. Copper provides a number of advantages for wiring applications including low resistivity and a high melting point.
>
> At present, aluminum is the material used in fabricating interconnects on most integrated circuits. This invention seeks to replace the aluminum with copper in the fabrication of advanced circuits and ultra-fast logic devices.
>
> **Many problems, however, are encountered in fabricating circuit interconnects with copper.** Some of the major difficulties include: (a) copper oxidizes easily at low temperatures; (2) copper has poor adhesion to substrates; (3) copper diffuses into silicon dioxide and other dielectric material used in micro-circuitry; and (4) copper requires a high temperature for patterning by reactive ion etching.

Thus, the art recognized that unique issues were associated with plating copper on semiconductor substrates. Accordingly, the skilled worker would not have considered it at all obvious to plate semiconductor microchip wafers with a composition reported for plating on printed circuit boards or gravure rolls as proposed by the instant rejection.

Clearly, the skilled worker would not have had any expectation of the excellent performance results achieved by use of the electroplating compositions of the invention for plating on semiconductor microchip wafers as demonstrated in the present application.

Indeed, Appellant has explained such distinction (as outlined in note 1, *supra*) in prior responses, and prior rejections based on reasoning similar to the instant rejection have been withdrawn in view of such explanation.[2]

The Dubin document adds little and reports a certain pulse-plating sequence. No incentive would have existed to modify the Dubin system based on the primary citation of Beach (which is specifically directed to gravure rolls) or Bernards (printed circuit boards). Nor do Beach or Bernards provide any suggestion that the reported compositions could be employed in a pulse-plating procedure.

B. Comparative data of record rebuts any prima facie case under Section 103 that may be contended to exist.

As discussed above, Examples 2 and 3 of the application detail comparative results which clearly rebut any prima facie case that may be contended to exist.

In those comparative examples, the brightener agent was bis-sodium-sulfonopropyl-disulfide. As discussed above, all the claims on appeal call for bis-sodium-sulfonopropyl-disulfide. In Example 2, using a copper electroplating composition of the invention, semiconductor microvias having 200 nm diameters and 7:1 aspect ratios were filled with copper

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[2] In particular, attention is directed to paper 16, Office Action dated January 24, 2003 at page 4, wherein the USPTO expressly withdrew rejections under 35 U.S.C. 103 in view of the same comments and evidence as set forth at note 1, supra. Specifically, the USPTO stated at page 4 of that paper 16

> The 35 USC §103 rejections as set forth in the previous Office action have been **withdrawn** in view of the argument submitted by Applicant on November 19, 2002.

Appellant submits that the USPTO should adopt now the same position the USPTO *has already adopted* in this case.

deposits having no defects as determined by focused beam examination. In comparative Example 3, a copper electroplating composition having a brightener concentration of 0.35 mg/l produced a copper deposit with defects in microvias having diameter of 200 nm and 4:1 aspect ratio. See pages 16-17 of the application.

These results clearly support patentability of all the pending claims.

2. Rejection of claims 124-132, 134-137, 141-154 and 158-167 under 35 U.S.C. §103 over Dahms et al. (U.S. Patent 3,778,357) in view of Dubin et al. (U.S. Patent 5,972,192) and further in view of Bernards et al.

(a) The rejection:

It is again acknowledged that none of three cited documents alone renders obvious Appellant's claimed invention.

The position is nevertheless taken that it would have been obvious to carefully select and combine isolated features of Dahms et al. (U.S. Patent 3,778,357), Dubin et al. (U.S. Patent 5,972,192) and Bernards et al. (U.S. Patent 5,972,192) and that careful combination would have rendered Appellant's claimed invention obvious.

As specifically admitted at page 4 of the Final Office Action dated August 15, 2006:

> "Dahms et al. do not teach using (1) plating on a semiconductor wafer substrate and (2) a sulfonopropyl disulfide as a brightener."

However, the position is taken as follows as stated at page 4-5 of the Final Office Action dated August 15, 2006:

> Dubin et al teach (col. 1, lines 5-40) electroplating copper onto a dielectric silicon layer of a microchip wafer with microvias and trenches.
>
> Therefore, it would have been obvious to one of ordinary skill in the art to have applied the copper electroplating method of Beach et al. to the silicon microchip wafer with microvias and trenches of Dubin et al because the method of Beach et al. has good electroplating characteristics.
>
> Bernards et al teach (see paragraph spanning cols. 2 and 3 and col. 4, lines 31-45) adding a polyether surfactant to a copper electroplating solution to improve throwing power of the solution (i.e.-improved even plating in high aspect ratio through holes (see discussion at col. 1, line 29 to col. 2, line 35).

Therefore, it would have been obvious to one of ordinary skill in the art to have added the polyether surfactant as a suppressor agent to the prior art copper plating solutions because Bernards et al teach that the polyether surfactant has the ability to improve even plating in high aspect ratio features.

Bernards et al. teach (see col. 6, lines 29-37) using a bis-sulfonopropyl disulfide as a brightener at an amount up to 3.0 ppm by weight of solution (which converts to 3.0 mg/L)/

Therefore, it would have been obvious to one of ordinary skill in the art to have used the bissulfopropyl disulfide compound of Bernards et al as the brightener of Dahms et al because the bissulfopropyl disulfide is a conventional brightener in copper electroplating that improves throwing power (see col. 5, line 49 to col. 6, line 13, esp. col. 6, lines 5-10) of the electroplating, thus making plating in vias and trenches more even.

(b) Appellant's position:

A. No incentive would have existed to combine the cited documents as proposed by the final rejection.

The skilled would not have had any incentive to carefully combine selected aspects of the cited documents as proposed by the instant rejection.

Indeed, Dahms et al. does ***not disclose any specific type of substrate for plating***. As mentioned above, the Bernards document is directed to printed circuit boards. As discussed, persons skilled in the art recognize that plating on copper on a microchip wafer is considerably more difficult, and possess unique issues, relative to plating copper on a printed circuit board. See note 1, *supra*.

Clearly, the skilled worker would not had no incentive to so carefully combine selected aspects of Dahms et al., Dubin et al. and Bernards et al. as proposed by the instant rejection. Indeed, the priority dates of the three citations span 25 years and no report existed during that time of the proposed combination of record.

In fact, the cited documents themselves specifically ***teach against*** the proposed combination. For instance, Dubin et al. reports use of a pulse-plating sequence to improve plating of vias. In that pulse plating sequence, use of relatively low concentration brightener is reported. See Dubin et al. at column 8, lines 4-16. In clear distinction, Dahms reports use of certain phosphonium ion compounds for plating at high current densities. In other words, the cited documents advance different goals to resolve the stated technical difficulty; those distinct goals of each of the cited documents indicate that the skilled worker clearly would not have had any incentive to make the proposed combination.

B. Comparative data of record rebuts any prima facie case under Section 103 that may be contended to exist.

As discussed above, Examples 2 and 3 of the application detail comparative results which clearly rebut any prima facie case that may be contended to exist. That discussion above is specifically incorporated by reference and repeated here.

These results clearly support patentability of all the pending claims.

3. Each of the claims on appeal is separately patentable.

The cited documents no suggestion of other aspects of Appellant's claimed invention.

a) Claim 125

For instance, claim 125 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 124 wherein the brightener concentration is at least about 2 mg per liter of the electroplating composition.

b) Claim 126

Claim 126 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 124 wherein the brightener concentration is at least about 3 mg per liter of the electroplating composition.

c) Claim 127

Claim 127 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 124 wherein the brightener concentration is at least about 4 mg per liter of the electroplating composition.

d) Claim 128

Claim 128 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 124 wherein the brightener concentration is at least about 5 mg per liter of the electroplating composition.

e) Claim 129

Claim 129 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 124 wherein the brightener concentration is at least about 6 mg per liter of the electroplating composition.

e) Claim 130

Claim 130 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 124 wherein the brightener concentration is at least about 8 mg per liter of the electroplating composition.

f) Claim 131

Claim 131 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 124 wherein the brightener concentration is at least about 10 mg per liter of the electroplating composition. Indeed, it is not seen from any of the cited documents to use such high brightener concentrations.

g) Claim 132

Claim 132 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 124 wherein the brightener concentration is at least about 15 mg per liter of the electroplating composition. It is not seen from any of the cited documents to use such high brightener concentrations.

h) Claim 134

Claim 134 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 124 wherein the suppressor agent is a polyether. As discussed above, Appellants' have found that use of a suppressor agent in combination with a brightener agent provides particularly good results. The comparative data at Examples 2 and 3 of the application include use of a polyether suppressor agent.

i) Claim 135

Claim 135 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 124 wherein the electroplating composition comprises a halide ion source.

j) Claim 136

Claim 136 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 124 wherein the microchip wafer substrate is electrically attached to a cathode of the system.

k) Claim 141

Claim 141 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 137 wherein the one or more brightener compounds have a molecular weight of about 1000 or less.

l) Claim 142

Claim 142 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 137 wherein the brightener concentration is at least about 2 mg per liter of the electroplating composition.

m) Claim 143

Claim 143 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 137 wherein the brightener concentration is at least about 3 mg per liter of the electroplating composition.

n) Claim 144

Claim 144 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 137 wherein the brightener concentration is at least about 4 mg per liter of the electroplating composition.

o) Claim 145

Claim 145 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 137 wherein the brightener

concentration is at least about 5 mg per liter of the electroplating composition.

p) Claim 146

Claim 146 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 137 wherein the brightener concentration is at least about 6 mg per liter of the electroplating composition.

q) Claim 147

Claim 147 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 137 wherein the brightener concentration is at least about 8 mg per liter of the electroplating composition. It is not seen from any of the cited documents to use such high brightener concentrations.

r) Claim 148

Claim 148 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 137 wherein the brightener concentration is at least about 10 mg per liter of the electroplating composition. It is not seen from any of the cited documents to use such high brightener concentrations.

s) Claim 149

Claim 149 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 137 wherein the brightener concentration is at least about 15 mg per liter of the electroplating composition. It is not seen from any of the cited documents to use such high brightener concentrations.

t) Claim 150

Claim 150 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 137 wherein the electroplating

composition further comprises a suppressor agent. As discussed above, the comparative data at Examples 2 and 3 of the application include use of a suppressor agent. Appellant has found that use of a suppressor agent in combination with a brightener agent provides particularly good results

u) Claim 151

Claim 151 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 150 wherein the suppressor agent is a polyether. The comparative data at Examples 2 and 3 of the application include use of a polyether suppressor agent.

v) Claim 152

Claim 152 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 137 wherein the electroplating comprises a halide ion source.

w) Claim 153

Claim 153 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 137 wherein the microchip wafer substrate is electrically attached to a cathode of the system.

x) Claim 158

Claim 158 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 154 wherein one or more brightener compounds have a molecular weight of about 1000 or less.

y) Claim 159

Claim 159 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 137 wherein the suppressor agent is

a polyether. The comparative data at Examples 2 and 3 of the application include use of a suppressor agent.

z) Claim 161

Claim 161 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 160 wherein the brightener concentration is at least about 2 mg per liter of the electroplating composition.

aa) Claim 162

Claim 162 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 160 wherein the brightener concentration is at least about 3 mg per liter of the electroplating composition.

bb) Claim 163

Claim 163 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 160 wherein the brightener concentration is at least about 4 mg per liter of the electroplating composition.

cc) Claim 164

Claim 164 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 160 wherein the brightener concentration is at least about 10 mg per liter of the electroplating composition. It is not seen from any of the cited documents to use such high brightener concentrations.

dd) Claim 165

Claim 165 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 160 wherein the brightener concentration is at least about 15 mg per liter of the electroplating composition. It is

not seen from any of the cited documents to use such high brightener concentrations.

ee) *Claim 166*

Claim 166 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 160 wherein the electroplating composition further comprises a suppressor agent. As discussed above, the comparative data at Examples 2 and 3 of the application include use of a suppressor agent. Appellant has found that use of a suppressor agent in combination with a brightener agent provides particularly good results

ff) *Claim 167*

Claim 167 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the method of claim 166 wherein the suppressor agent is a polyether. The comparative data at Examples 2 and 3 of the application include use of a polyether suppressor agent.

SUMMARY

Therefore, for the foregoing reasons, it is respectfully requested that the Board reverse the final rejection in this application.

Respectfully submitted,

Date: June 15, 2007

By: _____

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CLAIMS APPENDIX A

Claim 124. A method for plating a semiconductor microchip wafer substrate, comprising:

electrolytically depositing copper onto a semiconductor microchip wafer substrate having microvias or trenches from an electroplating composition that comprises at least one soluble copper salt, an electrolyte, a suppressor agent, and one or more brightener compounds having a molecular weight of about 1000 or less and that are present in a concentration of at least about 1.5 mg per liter of the electroplating composition,

wherein one or more brightener compounds comprise bis-sulfonopropyl disulfide.

Claim 125. The method of claim 124 wherein the brightener concentration is at least about 2 mg per liter of the electroplating composition.

Claim 126. The method of claim 124 wherein the brightener concentration is at least about 3 mg per liter of the electroplating composition.

Claim 127. The method of claim 124 wherein the brightener concentration is at least about 4 mg per liter of the electroplating composition.

Claim 128. The method of claim 124 wherein the brightener concentration is at least about 5 mg per liter of the electroplating composition.

Claim 129. The method of claim 124 wherein the brightener concentration is at least about 6 mg per liter of the electroplating composition.

Claim 130. The method of claim 124 wherein the brightener concentration is at least about 8 mg per liter of the electroplating composition.

Claim 131. The method of claim 124 wherein the brightener concentration is at least about 10 mg per liter of the electroplating composition.

Claim 132. The method of claim 124 wherein the brightener concentration is at least about 15 mg per liter of the electroplating composition.

Claim 134. The method of claim 124 wherein the suppressor agent is a polyether.

Claim 135. The method of claim 124 wherein the electroplating composition comprises a halide ion source.

Claim 136. The method of claim 124 wherein the microchip wafer substrate is electrically attached to a cathode of the system.

Claim 137. A method for plating a semiconductor microchip wafer substrate, comprising:

electrolytically depositing copper onto a semiconductor microchip wafer substrate having microvias or trenches from an electroplating composition that comprises at least one soluble copper salt, an electrolyte, and one or more brightener compounds present in a concentration of at least about 1.5 mg per liter of the electroplating composition,

wherein the one or more brightener compounds comprise a group of the formula R'-S-R-SO_3X where R is optionally substituted alkyl, optionally substituted heteroalkyl, optionally substituted aryl or optionally substituted heteroalicyclic; and X is a counter ion,

wherein one or more brightener compounds comprise bis-sulfonopropyl disulfide.

Claim 141. The method of claim 137 the one or more brightener compounds have a

molecular weight of about 1000 or less.

Claim 142. The method of claim 137 wherein the brightener concentration is at least about 2 mg per liter of the electroplating composition.

Claim 143. The method of claim 137 wherein the brightener concentration is at least about 3 mg per liter of the electroplating composition.

Claim 144. The method of claim 137 wherein the brightener concentration is at least about 4 mg per liter of the electroplating composition.

Claim 145. The method of claim 137 wherein the brightener concentration is at least about 5 mg per liter of the electroplating composition.

Claim 146. The method of claim 137 wherein the brightener concentration is at least about 6 mg per liter of the electroplating composition.

Claim 147. The method of claim 137 wherein the brightener concentration is at least about 8 mg per liter of the electroplating composition.

Claim 148. The method of claim 137 wherein the brightener concentration is at least about 10 mg per liter of the electroplating composition.

Claim 149. The method of claim 137 wherein the brightener concentration is at least about 15 mg per liter of the electroplating composition.

Claim 150. The method of claim 137 wherein the electroplating composition further comprises a suppressor agent.

Claim 151. The method of claim 150 wherein the suppressor agent is a polyether.

Claim 152. The method of claim 137 wherein the electroplating composition comprises a halide ion source.

Claim 153. The method of claim 137 wherein the microchip wafer substrate is electrically attached to a cathode of the system.

Claim 154. A method for plating a semiconductor microchip wafer substrate, comprising:

electrolytically depositing copper onto a semiconductor microchip wafer substrate having microvias or trenches from an electroplating composition that comprises at least one soluble copper salt, electrolyte, suppressor agent, and one or more brightener compounds present in a concentration of at least about 1.5 mg per liter of the electroplating composition,

wherein the one or more brightener compounds comprise a group of the formula R'-S-R-SO_3X where R is optionally substituted alkyl, optionally substituted heteroalkyl, optionally substituted aryl or optionally substituted heteroalicyclic; and X is a counter ion,

wherein one or more brightener compounds comprise bis-sulfonopropyl disulfide.

Claim 158. The method of claim 154 one or more brightener compounds have a molecular weight of about 1000 or less.

Claim 159. The method of claim 154 wherein the suppressor agent is a polyether.

Claim 160. A method for plating a semiconductor microchip wafer substrate, comprising:

electrolytically depositing copper onto a semiconductor microchip wafer substrate having microvias or trenches from an electroplating composition that comprises at least one soluble copper salt, an electrolyte, and one or more brightener compounds that comprise bis-

sulfonopropyl disulfide and the one or more brightener compounds present in a concentration of at least about 1.5 mg per liter of the electroplating composition.

Claim 161. The method of claim 160 wherein the brightener concentration is at least about 2 mg per liter of the electroplating composition.

Claim 162. The method of claim 160 wherein the brightener concentration is at least about 3 mg per liter of the electroplating composition.

Claim 163. The method of claim 160 wherein the brightener concentration is at least about 4 mg per liter of the electroplating composition.

Claim 164. The method of claim 160 wherein the brightener concentration is at least about 10 mg per liter of the electroplating composition.

Claim 165. The method of claim 160 wherein the brightener concentration is at least about 15 mg per liter of the electroplating composition.

Claim 166. The method of claim 160 wherein the electroplating composition further comprises a suppressor agent.

Claim 167. The method of claim 166 wherein the suppressor agent is a polyether.

EVIDENCE APPENDIX B

Docket No. 50439-2

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT:	Barstad et al.		
SERIAL NO.	09/605,442	GROUP:	1741
FILED:	June 28, 2000	EXAMINER:	W. Nicholas
FOR:	ELECTROLYTIC COPPER PLATING SOLUTIONS		

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION UNDER 37 CFR 1.131

The undersigned declare as follows:

1. We are co-inventors of the above-identified patent application ("the patent application") assigned to the Shipley Company.

2. Prior to January 11, 1999, we conceived of, made and used electrolytic copper plating compositions that contained at least one copper salt, an electrolyte, and one or more brightener compounds in amounts greater than 1.5 mg per liter of the plating composition. Brightener compounds used in those electrolytic copper plating compositions prior to January 11, 1999 included compounds that had a molecular weight of less than 1000 and compounds having sulfide and sulfonic acid groups. Prior to January 11, 1999, using such electrolytic copper plating compositions, we electrolytically deposited copper onto semiconductor wafers that contained microvias and trenches.

3. Attached as Exhibits 1 and 2 are true and accurate copies of laboratory notebook records (notebook pages 22 and 23 respectively), with dates deleted, of such actual work discussed in paragraph 2 above and completed prior to January 11, 1999. For instance, those Exhibits 1 and 2 disclose use of a copper electroplating composition identified as Nanoplate

2001, which is the same copper electroplating composition as disclosed in Example 2 on page 16 of the patent application. That Nanoplate 2001 electroplating composition contained a copper salt, an acidic electrolyte, a brightener of bis-sodium-sulfonopropyl-disulfide in an amount of 2.4 mg/liter, and a suppressor of propylene glycol copolymer. At Exhibit 2, copper electroplating of 1000 semiconductor wafers with the Nanoplate 2001 composition is reported. The designation of "Q" indicates test semiconductor wafers that contain trenches and the designation of "M" indicates test semiconductor wafers that contain microvias.

4. We hereby further declare that all statements made herein of our own knowledge are true and all statements made on information and belief are believed to be true, and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, and that such willful false statements may jeopardize the validity of the above-identified application or any patent issued thereon.

Date: 1-16-04 Leon R. Barstad

Date: 1-16-04 James E. Rychwalski

Date: 1-16-04 Mark Lefebvre

Date: _____ Stephane Minard

Date: _____ _____
James L. Martin

Date: _____ _____
Robert A. Schetty

Date: _____ _____
Michael P. Toben

Exhibit 1

Project: Nanophil 2000 Bath Life Test
Notebook Number: 8111

Date	Time	TBA	Manual B-2 Add	Auto B-2 Add	Comments
	6:40 AM	4.36	50		Add 800 mls D.I.
		14.85			shut off pump
	11:25	11:00	7		Turned on Fral pump Hi
	12:30	12.25			(25)
Line Down	2:00				(20)
	3:00			44	Add 900 mL D.I.
Line Down					
					(910)

Time	TBA	Manual B-2 Add	Auto B-2 Add	Comments
845				Add 850 mL D.I.
850	3.0	60		
4:10	12.9			
				(10)
				(920)

Time	TBA	Manual B-2 Add	Auto B-2 Add	Comments
6:05				Add 900 mL D.I.
6:20	6.27	40		
6:45	13.50			
8:45	11:04	7	Auto dose turned on	Processed 1000 test coupons
8:50	12:45			Removed 600 mls bath
				Added 570 mls Starter
				30 mls D.I.

Signature [signature]

Date

22

Read and Understood By:

Signature [signature]

Date

[redacted]

Exhibit 2

roject: Naugh / zer bath Life test   Notebook Number: 3110

1000 water processed wafer lot #

Q	8111704-10	Processed at 8:45 Am
Q	8111704-11	"
Q	8111704-12	"
Q	8111704-13	"
Q	8111704-14	"
Q	8111704-15	"
B	8112319-16	"
B	8112319-15	"
B	8112319-14	"
B	8112315-13	"
M	47133-23-F3	"

Date	Time	TBA	Manual B-2 add	Auto B-2 add	Comments
					(25)
	9:40	12.7	20		
	10:45	13.96			
	11:40	13.26			Pump off
	2:00	11.00			(25)
					(25)
	4:00	Shut Down			(25) ADD 1800 mls D.I. for water lost
					(6020)

Signature ____

Date ____

Read and Understood By:

Signature ____

Date ____

Docket No. 50439-2

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT:	Barstad et al.		
SERIAL NO.	09/605,442	GROUP:	1741
FILED:	June 28, 2000	EXAMINER:	W. Nicholas
FOR:	ELECTROLYTIC COPPER PLATING SOLUTIONS		

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION UNDER 37 CFR 1.131

The undersigned declare as follows:

1. We are co-inventors of the above-identified patent application ("the patent application") assigned to the Shipley Company.

2. Prior to January 11, 1999, we conceived of, made and used electrolytic copper plating compositions that contained at least one copper salt, an electrolyte, and one or more brightener compounds in amounts greater than 1.5 mg per liter of the plating composition. Brightener compounds used in those electrolytic copper plating compositions prior to January 11, 1999 included compounds that had a molecular weight of less than 1000 and compounds having sulfide and sulfonic acid groups. Prior to January 11, 1999, using such electrolytic copper plating compositions, we electrolytically deposited copper onto semiconductor wafers that contained microvias and tronches.

3. Attached as Exhibits 1 and 2 are true and accurate copies of laboratory notebook records (notebook pages 22 and 23 respectively), with dates deleted, of such actual work discussed in paragraph 2 above and completed prior to January 11, 1999. For instance, those Exhibits 1 and 2 disclose use of a copper electroplating composition identified as Nanoplate

2001, which is the same copper electroplating composition as disclosed in Example 2 on page 16 of the patent application. That Nanoplate 2001 electroplating composition contained a copper salt, an acidic electrolyte, a brightener of bis-sodium-sulfonopropyl-disulfide in an amount of 2.4 mg/liter, and a suppressor of propylene glycol copolymer. At Exhibit 2, copper electroplating of 1000 semiconductor wafers with the Nanoplate 2001 composition is reported. The designation of "Q" indicates test semiconductor wafers that contain trenches and the designation of "M" indicates test semiconductor wafers that contain microvias.

4. We hereby further declare that all statements made herein of our own knowledge are true and all statements made on information and belief are believed to be true, and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, and that such willful false statements may jeopardize the validity of the above-identified application or any patent issued thereon.

Date: _____ _____
Leon R. Barstad

Date: _____ _____
James E. Rychwalski

Date: _____ _____
Mark Lefebvre

Date: _____ _____
Stephane Minard

Date: Jan. 20, 2004

James L. Martin

Date: _____

Robert A. Schetty

Date: _____

Michael P. Toben

Exhibit 1

Project: [illegible] 2000 Bath Life Test

Notebook Number: 311

Date	Time	TBA	Manual B-2 Add	Auto B-2 Add	Comments
	6:40 Am	4.36	50		Add 600 mls D.I.
		14.85			Shut off pump
	11:25	11:00	7		Turned on feed pump Htr
	12:30	12.25			(25)
Line Down	2:00				(20)
	3:00			44	Added 900 mL D.I.
Line Down					
					(910)

Time	TBA	Manual B-2 Add	Auto B-2 Add	Comments
845				Add 850 mL D.I.
850	3.0	60		
4:10	12.9			
				(80)
				(920)

Time	TBA	Manual B-2 Add	Auto B-2 Add	Comments
6:05				Add 900 mL D.I.
6:20	6.27	40		
6:45	13.58			
8:45	11:04	7	Auto dosing turned on	Processed 1000 feet water
8:50	12:45			Removed 600 mls bath
				Added 570 mls Starter
				30 mls D.I.

Signature [signature]

Date

22

Read and Understood By:

Signature [signature]

Date

[redacted]

Exhibit 2

Project: Xanoph / Zeus bad life test   Notebook Number: 3110

1000 water removal water test

Q	8111704-10	Processed at 8:45 AM
Q	8111704-11	"
Q	8111704-12	"
Q	8111704-13	"
Q	8111704-14	"
Q	8111704-15	"
B	8112319-16	"
B	8112319-15	"
B	8112319-14	"
B	8112319-13	"
M	47133-23-F3	"

Date	Time	TBA	Manual 8-2 ads	Auto 8-2 ads	Comments
					25
	9:40	12.7	20		
	10:45	13.96			
	11:40	13.26			Pump off
	2:00	11.00			25
					25
	4:00	Shut Down			25 Add 180 mls D.I. for water bed there
					1020

Signature: [signature]   Read and Understood By: [signature]

Date   Date

Docket No. 50439-2

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT:	Barstad et al.		
SERIAL NO.	09/605,442	GROUP:	1741
FILED:	June 28, 2000	EXAMINER:	W. Nicholas
FOR:	ELECTROLYTIC COPPER PLATING SOLUTIONS		

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION UNDER 37 CFR 1.131

The undersigned declare as follows:

1. We are co-inventors of the above-identified patent application ("the patent application") assigned to the Shipley Company.

2. Prior to January 11, 1999, we conceived of, made and used electrolytic copper plating compositions that contained at least one copper salt, an electrolyte, and one or more brightener compounds in amounts greater than 1.5 mg per liter of the plating composition. Brightener compounds used in those electrolytic copper plating compositions prior to January 11, 1999 included compounds that had a molecular weight of less than 1000 and compounds having sulfide and sulfonic acid groups. Prior to January 11, 1999, using such electrolytic copper plating compositions, we electrolytically deposited copper onto semiconductor wafers that contained microvias and trenches.

3. Attached as Exhibits 1 and 2 are true and accurate copies of laboratory notebook records (notebook pages 22 and 23 respectively), with dates deleted, of such actual work discussed in paragraph 2 above and completed prior to January 11, 1999. For instance, those Exhibits 1 and 2 disclose use of a copper electroplating composition identified as Nanoplate

2001, which is the same copper electroplating composition as disclosed in Example 2 on page 16 of the patent application. That Nanoplate 2001 electroplating composition contained a copper salt, an acidic electrolyte, a brightener of bis-sodium-sulfonopropyl-disulfide in an amount of 2.4 mg/liter, and a suppressor of propylene glycol copolymer. At Exhibit 2, copper electroplating of 1000 semiconductor wafers with the Nanoplate 2001 composition is reported. The designation of "Q" indicates test semiconductor wafers that contain trenches and the designation of "M" indicates test semiconductor wafers that contain microvias.

4. We hereby further declare that all statements made herein of our own knowledge are true and all statements made on information and belief are believed to be true, and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, and that such willful false statements may jeopardize the validity of the above-identified application or any patent issued thereon.

Date: _____ _____
Leon R. Barstad

Date: _____ _____
James E. Rychwalski

Date: _____ _____
Mark Lefebvre

Date: _____ _____
Stephane Minard

Date: _____ James L. Martin

Date: _____ Robert A. Schetty

Date: 1/16/04 Michael P. Tobin

Exhibit 1

Project: Newplate 2000 Bath Life Test Notebook Number: 3111

Date	Time	TBA	Manual B-2 Add	Auto B-2 Add	Comments
	6:40 am	4.36	50		Add 800 mls D.I.
		14.85			Shut off pump
	11:25	11:00	7		Turned on Feed pump HH
	12:30	12.25			(25)
Line Down	2:00				(20)
	3:00			44	Added 900 mL D.I.
Line Down					(910)

Time	TBA	Manual B-2 Add	Auto B-2 Add	Comments
845				Add 850 mL D.I.
850	3.0	60		
9:10	12.9			
				(80)
				(920)

Time	TBA	Manual B-2 Add	Auto B-2 Add	Comments
6:05				Add 900 mL D.I.
6:20	6.22	40		
6:45	13.58			
8:45	11:04	7	Auto Line turned on	Processed 1000 feet coated
8:50	12:45			Removed 600 mls bath

Signature [signature]

Date

22

Read and Understood By: [signature]

Signature

Date

Added 570 mls Starter
30 mls D.I.

[redacted]

Exhibit 2

roject: Xanyl/Zea ... Lift test Notebook Number: 3110

1000 water poured ... ...

Q	8111704-10	Processed at 8:45 AM
Q	8111704 - 11	"
Q	8111704 - 12	"
Q	8111704 - 13	"
Q	8111704 - 14	"
Q	8111704 - 15	"
B	8112319 - 16	"
B	8112319 - 15	"
B	8112319 - 14	"
B	8112315 - 13	"
M	47133-23-F3	"

Date	Time	TBA	Manual B-2 ...	Auto B-2 ...	Comments
					25
	9:40	12.7	20		
	10:45	13.96			
	11:40	13.26			... off 25
	2:00	11.00			25
	4:00	S/D - Down			25 All 18... D.I. ...
					1020

Read and Understood By

Signature Signature

Date Date

Docket No. 50439-2

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT:	Barstad et al.		
SERIAL NO.	09/605,442	GROUP:	1741
FILED:	June 28, 2000	EXAMINER:	W. Nicholas
FOR:	ELECTROLYTIC COPPER PLATING SOLUTIONS		

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION UNDER 37 CFR 1.131

The undersigned declare as follows:

1. We are co-inventors of the above-identified patent application ("the patent application") assigned to the Shipley Company.

2. Prior to January 11, 1999, we conceived of, made and used electrolytic copper plating compositions that contained at least one copper salt, an electrolyte, and one or more brightener compounds in amounts greater than 1.5 mg per liter of the plating composition. Brightener compounds used in these electrolytic copper plating compositions prior to January 11, 1999 included compounds that had a molecular weight of less than 1000 and compounds having sulfide and sulfonic acid groups. Prior to January 11, 1999, using such electrolytic copper plating compositions, we electrolytically deposited copper onto semiconductor wafers that contained microvias and trenches.

3. Attached as Exhibits 1 and 2 are true and accurate copies of laboratory notebook records (notebook pages 22 and 23 respectively), with dates deleted, of such actual work discussed in paragraph 2 above and completed prior to January 11, 1999. For instance, these Exhibits 1 and 2 disclose use of a copper electroplating composition identified as Nanoplate

2001, which is the same copper electroplating composition as disclosed in Example 2 on page 16 of the patent application. That Nanoplate 2001 electroplating composition contained a copper salt, an acidic electrolyte, a brightener of bis-sodium-sulfonopropyl-disulfide in an amount of 2.4 mg/liter, and a suppressor of propylene glycol copolymer. At Exhibit 2, copper electroplating of 1000 semiconductor wafers with the Nanoplate 2001 composition is reported. The designation of "Q" indicates test semiconductor wafers that contain trenches and the designation of "M" indicates test semiconductor wafers that contain microvias.

4. We hereby further declare that all statements made herein of our own knowledge are true and all statements made on information and belief are believed to be true, and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, and that such willful false statements may jeopardize the validity of the above-identified application or any patent issued thereon.

Date: _____ Leon R. Barstad

Date: _____ James E. Rychwalski

Date: _____ Mark Lefebvre

Date: 01/16/2004 Stephane Ménard

Date: _____ James L. Martin

Date: _____ Robert A. Schoffy

Date: _____ Michael P. Tobon

Exhibit 1

Project: [illegible] 2000 Bath [illegible] Test — Notebook Number: [illegible]

Date	Time	TBA	Manual A-2 ADD	Auto A-2 ADD	Comments
	6:40 am	4.96	50		ADD 600 mls D.I.
		14.85			Shut off purge. Turned on Feed pump
	11:25	11:00	7		25
	12:30	12.25			
Line Down	2:00				20
	3:00			44	Added 900 mL D.I.
Line	Down				970

Time	TBA	Manual A-2 ADD	Auto A-2 ADD	Comments
845				ADD 850 mL D.I.
850	3.0	60		
9:10	12.9			80
				920

Time	TBA	Manual A-2 ADD	Auto A-2 ADD	Comments
6:05				ADD 900 mL D.I.
6:20	6.27	40		
6:45	13.50			
8:45	11:04	7	Turned on	Drained 7000 [illegible]
8:50	12:45			Removed 600 mls [illegible]. Added 570 mls [illegible] 30 mls D.I.

Signature [signature] — Read and Understood By: Signature [signature]

Date — Date

32

Best Available Copy

[redacted]

Exhibit 2

Project: Xhangjie / Zoos [illegible] Life test   Notebook Number: 3110

1000 water pressure [illegible]

Q	8111704 - 10	Processed at 8:40 Am
Q	8111704 - 11	"
Q	8111704 - 12	"
Q	8111704 - 13	"
Q	8111704 - 14	"
Q	8111704 - 15	"
B	8112319 - 16	"
B	8112319 - 15	"
B	8112319 - 14	"
B	8112319 - 13	"
M	42121-23 - F3	"

Date	Time	TBA	[illegible]	[illegible]	Comments
					25
	9:40	12.7	20		
	10:45	12.96			
	11:40	12.26			Pump off 28
	2:00	11.00			25
	4:00	Shut Down			26 ADD [illegible] D.I. [illegible]
					1020

Read and Understood By:

Signature   Signature

Date   Date

93

Docket No. 50439-2

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT:	Barstad et al.		
SERIAL NO.:	09/605,442	EXAMINER:	W. Nicholas
FILED:	June 28, 2000	GROUP:	1742
FOR:	ELECTROLYTIC COPPER PLATING SOLUTIONS		

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION

I, Peter Corless, declare as follows:

1. I am an attorney of record of the above-identified application ("the application"), which has been assigned by all the inventors to the Shipley Company, L.L.C. A copy of the executed Assignment for the application is attached.

2. Named inventor Robert Schetty is no longer employed by the Shipley Company. I sent by Federal Express to the last known residence address of Robert Schetty a Declaration under 37 CFR 1.131 for the application for Robert Schetty's review and signature. That overnight mail included an envelope with postage pre-paid for the signed Declaration to be returned to me by overnight service. That correspondence to Robert Schetty was returned to me by Federal Express as being undeliverable.

3. Previously, in patent application number 09/957,218 also assigned to Shipley Company and having Robert Schetty as a named inventor, Robert Schetty refused to sign a Declaration under 37 CFR 1.63. An attorney of record in that case filed a petition (which was granted) to accept the Declaration under 37 CFR 1.63 without Robert Schetty's signature.

4. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements are made with the knowledge that willful and false statements and the like so made are punishable by fine or imprisonment, and that such willful false statements may jeopardize the validity of the above-identified application or any patent issued thereon.

Date: February 13, 2004

Peter F. Corless

ASSIGNMENT

WHEREAS, I, Leon R. Barstad of Raynham, Massachuetts, I, James E. Rychwalski of Medway, Massachuetts, I, Mark Lefebvre of Hudson, New Hampshire, I, Stephane Menard of , I, James L. Martin of Merrick, New York, I, Robert A. Schetty, III of Fort Salonga, New York and I, Michael P. Toben of Smithtown, New York, (hereinafter referred to as "Assignors"), have invented certain new and useful improvements in "ELECTROLYTIC COPPER PLATING SOLUTIONS", for which an application for United States Letters Patent was filed on June 28, 2000 and assigned U.S. Serial No. 09/605,442 which application claims priority of U.S. Serial No. 09/313,045, , filed May 17, 1999, and

WHEREAS, Shipley Company, L.L.C., located at 455 Forest Street, Marlborough, Massachusetts 01752, (hereinafter referred to as the "Assignee"), is desirous of acquiring the entire right, title and interest in and to the same invention, and in and to the said application, and any Letters Patent that may issue thereon;

NOW, THEREFORE, TO ALL WHOM IT MAY CONCERN, be it known that for the above consideration, the Assignors have assigned and transferred, and do hereby assign and transfer to the Assignee, its successors and assigns, their entire right, title and interest for the United States in and to the said invention and in and to the said application and all patents which may be granted therefor, and all divisions, reissues, substitutions, continuations, in whole or in part, re-examinations, and extensions thereof, and all applications claiming priority therefrom; and the Assignors hereby authorize and request the Commissioner of Patents and Trademarks to issue all patents for said invention, or patents resulting therefrom, insofar as their interest is concerned, to the Assignee; to have and to hold for the sole and exclusive use and benefit of the Assignee, its successors and assigns, to the full end of the term or terms for which any and all of said Letters Patent for said invention may issue, to the same extent as the Assignors would hold and enjoy if this Assignment had not been made.

The Assignors also have assigned and transferred, and do hereby assign and transfer to the Assignee, its successors and assigns, their entire right, title and interest in and to the invention disclosed in said application, in all countries of the world foreign to the United States, including the right to file applications and obtain patents for said invention in its own name in said countries and including all rights of priority in said countries under the terms of any applicable international convention; to have and to hold for the sole and exclusive use and benefit of the Assignee, its successors and assigns, to the full end of the term or terms for which any and all of said Letters Patent for said invention may issue, to the same extent as the Assignors would hold and enjoy if this Assignment had not been made.

The Assignors further agree to execute any and all patent applications, assignments, affidavits, and any other papers in connection therewith necessary to perfect such patent rights, and also agree, at the request of the Assignee, to testify in any legal proceedings, sign all lawful papers, make all lawful oaths, and generally do everything possible to aid said Assignee, its successors and assigns, to obtain, maintain and enforce patent protection for said invention in all countries.

The Assignors also hereby grant the law firm of EDWARDS & ANGELL, LLP, Dike, Bronstein, Roberts & Cushman, IP Group, the power to insert on this Assignment any further identification which may be necessary or desirable in order to comply with the rules of the United States Patent and Trademark Office for recordation of this document.

IN WITNESS WHEREOF, the Assignors have caused this Assignment to be executed.

Dated this 13 day of March, 2001.

L R Barstad
Leon R. BARSTAD

Dated this 15 day of March, 2001.

James E. RYCHWALSKI

Dated this 15 day of March, 2001.

Mark LEFEBVRE

Dated this ____ day of _____, _____.

Stephane MENARD

Dated this ____ day of _____, _____.

James L. MARTIN

Dated this ____ day of _____, _____.

Robert A. SCHETTY, III

Dated this ____ day of _____, _____.

Michael TOBEN

ASSIGNMENT

WHEREAS, I, Leon R. Barstad of Raynham, Massachuetts, I, James E. Rychwalski of Medway, Massachuetts, I, Mark Lefebvre of Hudson, New Hampshire, I, Stephane Menard of , I, James L. Martin of Merrick, New York, I, Robert A. Schetty, III of Port Salonga, New York and I, Michael P. Toben of Smithtown, New York, (hereinafter referred to as "Assignors"), have invented certain new and useful improvements in "ELECTROLYTIC COPPER PLATING SOLUTIONS", for which an application for United States Letters Patent was filed on June 28, 2000 and assigned U.S. Serial No. 09/605,442 which application claims priority of U.S. Serial No. 09/313,045, , filed May 17, 1999, and

WHEREAS, Shipley Company, L.L.C., located at 455 Forest Street, Marlborough, Massachusetts 01752, (hereinafter referred to as the "Assignee"), is desirous of acquiring the entire right, title and interest in and to the same invention, and in and to the said application, and any Letters Patent that may issue thereon;

NOW, THEREFORE, TO ALL WHOM IT MAY CONCERN, be it known that for the above consideration, the Assignors have assigned and transferred, and do hereby assign and transfer to the Assignee, its successors and assigns, their entire right, title and interest for the United States in and to the said invention and in and to the said application and all patents which may be granted therefor, and all divisions, reissues, substitutions, continuations, in whole or in part, re-examinations, and extensions thereof, and all applications claiming priority therefrom; and the Assignors hereby authorize and request the Commissioner of Patents and Trademarks to issue all patents for said invention, or patents resulting therefrom, insofar as their interest is concerned, to the Assignee; to have and to hold for the sole and exclusive use and benefit of the Assignee, its successors and assigns, to the full end of the term or terms for which any and all of said Letters Patent for said invention may issue, to the same extent as the Assignors would hold and enjoy if this Assignment had not been made.

The Assignors also have assigned and transferred, and do hereby assign and transfer to the Assignee, its successors and assigns, their entire right, title and interest in and to the invention disclosed in said application, in all countries of the world foreign to the United States, including the right to file applications and obtain patents for said invention in its own name in said countries and including all rights of priority in said countries under the terms of any applicable international convention; to have and to hold for the sole and exclusive use and benefit of the Assignee, its successors and assigns, to the full end of the term or terms for which any and all of said Letters Patent for said invention may issue, to the same extent as the Assignors would hold and enjoy if this Assignment had not been made.

The Assignors further agree to execute any and all patent applications, assignments, affidavits, and any other papers in connection therewith necessary to perfect such patent rights, and also agree, at the request of the Assignee, to testify in any legal proceedings, sign all lawful papers, make all lawful oaths, and generally do everything possible to aid said Assignee, its successors and assigns, to obtain, maintain and enforce patent protection for said invention in all countries.

The Assignors also hereby grant the law firm of EDWARDS & ANGELL, LLP, Dike, Bronstein, Roberts & Cushman, IP Group, the power to insert on this Assignment any further identification which may be necessary or desirable in order to comply with the rules of the United States Patent and Trademark Office for recordation of this document.

IN WITNESS WHEREOF, the Assignors have caused this Assignment to be executed.

Dated this ____ day of _____, ____.

Leon R. BARSTAD

Dated this ____ day of _____, ____.

James E. RYCHWALSKI

Dated this ____ day of _____, ____.

Mark LEFEBVRE

Dated this ____ day of _____, ____.

Stephane MENARD

Dated this ____ day of _____, ____.

James L. MARTIN

Dated this 23 day of April, 2001.

Robert A. SCHETTY, III

Dated this ____ day of _____, ____.

Michael TOBEN

Attorney Docket No. 50439-2
Page 1 of 2

ASSIGNMENT

WHEREAS, I, Leon R. Barstad of Raynham, Massachuetts, I, James E. Rychwalski of Medway, Massachuetts, I, Mark Lefebvre of Hudson, New Hampshire, I, Stephane Menard of , I, James L. Martin of Merrick, New York, I, Robert A. Schetty, III of Fort Salonga, New York and I, Michael P. Toben of Smithtown, New York, (hereinafter referred to as "Assignors"), have invented certain new and useful improvements in "ELECTROLYTIC COPPER PLATING SOLUTIONS", for which an application for United States Letters Patent was filed on June 28, 2000 and assigned U.S. Serial No. 09/605,442 which application claims priority of U.S. Serial No. 09/313,045, , filed May 17, 1999, and

WHEREAS, Shipley Company, L.L.C., located at 455 Forest Street, Marlborough, Massachusetts 01752, (hereinafter referred to as the "Assignee"), is desirous of acquiring the entire right, title and interest in and to the same invention, and in and to the said application, and any Letters Patent that may issue thereon;

NOW, THEREFORE, TO ALL WHOM IT MAY CONCERN, be it known that for the above consideration, the Assignors have assigned and transferred, and do hereby assign and transfer to the Assignee, its successors and assigns, their entire right, title and interest for the United States in and to the said invention and in and to the said application and all patents which may be granted therefor, and all divisions, reissues, substitutions, continuations, in whole or in part, re-examinations, and extensions thereof, and all applications claiming priority therefrom; and the Assignors hereby authorize and request the Commissioner of Patents and Trademarks to issue all patents for said invention, or patents resulting therefrom, insofar as their interest is concerned, to the Assignee; to have and to hold for the sole and exclusive use and benefit of the Assignee, its successors and assigns, to the full end of the term or terms for which any and all of said Letters Patent for said invention may issue, to the same extent as the Assignors would hold and enjoy if this Assignment had not been made.

The Assignors also have assigned and transferred, and do hereby assign and transfer to the Assignee, its successors and assigns, their entire right, title and interest in and to the invention disclosed in said application, in all countries of the world foreign to the United States, including the right to file applications and obtain patents for said invention in its own name in said countries and including all rights of priority in said countries under the terms of any applicable international convention; to have and to hold for the sole and exclusive use and benefit of the Assignee, its successors and assigns, to the full end of the term or terms for which any and all of said Letters Patent for said invention may issue, to the same extent as the Assignors would hold and enjoy if this Assignment had not been made.

The Assignors further agree to execute any and all patent applications, assignments, affidavits, and any other papers in connection therewith necessary to perfect such patent rights, and also agree, at the request of the Assignee, to testify in any legal proceedings, sign all lawful papers, make all lawful oaths, and generally do everything possible to aid said Assignee, its successors and assigns, to obtain, maintain and enforce patent protection for said invention in all countries.

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IN WITNESS WHEREOF, the Assignors have caused this Assignment to be executed.

Dated this ____ day of _____, ____.

Leon R. BARSTAD

Dated this ____ day of _____, ____.

James E. RYCHWALSKI

Dated this ____ day of _____, ____.

Mark LEFEBVRE

Dated this 23rd day of April, 2001.

Stephane MENARD

Dated this ____ day of _____, ____.

James L. MARTIN

Dated this ____ day of _____, ____.

Robert A. SCHETTY, III

Dated this ____ day of _____, ____.

Michael TOBEN

ASSIGNMENT

WHEREAS, I, Leon R. Barstad of Raynham, Massachuetts, I, James E. Rychwalski of Medway, Massachuetts, I, Mark Lefebvre of Hudson, New Hampshire, I, Stephane Menard of , I, James L. Martin of Merrick, New York, I, Robert A. Schetty, III of Port Salonga, New York and I, Michael P. Toben of Smithtown, New York, (hereinafter referred to as "Assignors"), have invented certain new and useful improvements in "ELECTROLYTIC COPPER PLATING SOLUTIONS", for which an application for United States Letters Patent was filed on June 28, 2000 and assigned U.S. Serial No. 09/605,442 which application claims priority of U.S. Serial No. 09/313,045, , filed May 17, 1999, and

WHEREAS, Shipley Company, L.L.C., located at 455 Forest Street, Marlborough, Massachusetts 01752, (hereinafter referred to as the "Assignee"), is desirous of acquiring the entire right, title and interest in and to the same invention, and in and to the said application, and any Letters Patent that may issue thereon;

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IN WITNESS WHEREOF, the Assignors have caused this Assignment to be executed.

Dated this ____ day of _____, ____.

Leon R. BARSTAD

Dated this ____ day of _____, ____.

James E. RYCHWALSKI

Dated this ____ day of _____, ____.

Mark LEFEBVRE

Dated this ____ day of _____, ____.

Stephane MENARD

Dated this 19 day of April, 2001.

James L. MARTIN

Dated this ____ day of _____, ____.

Robert A. SCHIFFY, III

Dated this 19 day of April, 2001.

Michael TOBEN